

## PARASITES OF THE PSYLLIDAE<sup>1</sup>

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### INTRODUCTION

In the course of a study of the Psyllidae, information relating to their parasites has been collected. This information consists both of observations made by the writer and of previously published records. All of these have been combined and summarized in Tables I and 2. Table 1 lists the parasites of psyllids arranged according to order, superfamily, family, genus, and species. Table 2 lists the psyllid species from which parasites have been reared. In both tables the taxonomic groups are arranged in alphabetical rather than phylogenetic order. Geographical regions and literature references are given for the records cited. Except for the dipterous family Itonididae, all parasites are in the Hymenoptera.

Records have not been found of parasites attacking psyllid eggs. The nymphal stage of the psyllid is parasitized in all cases except those involving the gall midge genus *Endopsylla* which is endoparasitic in adult psyllids. The itonidid genera *Lestodiplosis* and *Bremia* are normally considered to be predatory in habit. Records of their attack on the Psyllidae are included here, however, because their relationship to the psyllid host is inadequately understood. Lal (1934) listed them as parasites of adult psyllids, but Rübsaamen (1901) has stated definitely that the psyllid "larvae" were the host stage attacked by *Lestodiplosis liviae* Rübs.

During the investigations reported here, a special effort has been made to rear as many of the Psyllidae as possible from the nymph to the adult stage to determine the nymphal characteristics of the various species. This is an indispensable basis for identifying the immature stages and for a more complete understanding of the relationships within the family. For example, certain species which have been considered closely related on the basis of adult characteristics are only distantly related if judged by those of the nymphs. Then too, because most parasites attack the nymphs rather than the adults, the nymphs must be identifiable if the host species is to be determined.

As part of the study, parasites were reared from the nymphs of 11 genera and 34 species of Psyllidae. Determinations to date indicate that 5 families

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and at least 8 genera and 15 species of parasitic Hymenoptera were represented in the reared material. Unless otherwise stated, all new records listed in the paper were based on collections and rearings made by the writer.

## HOST-PARASITE RELATIONSHIPS

**Habitat of psyllid nymphs.** Among the psyllid species found parasitized in North America, the nymphs show wide variation in the degree to which they are exposed or concealed on the host plant. In several species the nymphs produce a waxy covering under which they feed. In most species, however, the nymphs are naked and feed on the relatively unmodified surface of the host plant. For some species of *Arytaina* most of the nymphal development takes place on the old wood of the host at or just below the ground level. In other species the feeding of the nymphs causes the infested leaves to curl so that the nymphs are sheltered inside. The hackberry psyllids (*Pachypsylla* spp.) cause the host plant to produce true galls of various types in which the nymphs develop.

At the present time there appears to be no relationship between the degree of parasitism and the apparent exposure and accessibility of the nymphs to parasite attack. In fact, the nymphs of *Pachypsylla* spp., which develop inside leaf and petiole galls, seem to have a higher percentage of parasitized nymphs than do most of the species in genera whose nymphs would appear to be more vulnerable to attack.

**Development of parasites.** All of the parasitized nymphs in this investigation had been parasitized in the field before they were collected. Thus specific information was not obtained on the time and mode of oviposition. In nearly all cases the nymphs were in the last or next-to-last instar before they showed evidence of being parasitized. Nymphs apparently remain active and show no conspicuous evidence of being parasitized for several days after the parasite has laid its egg. In one case a nymph of *Arytaina essigi* Jensen, confined alone in a vial with food, remained active for two weeks. Two adults of *Prionomitus mitratus* (Dalm.) subsequently emerged from this nymph, the second appearing three days after the first.

As the parasite larva develops, the activity of the nymph diminishes. Finally the nymph is represented only by its exoskeleton which assumes a swollen, parchment-like appearance. At this stage the parasite pupa can be seen through the nymphal integument.

Although most of the parasitic species develop within the body cavity of the nymph this is not the case for *Tetrastichus triozae* Burks and may not be true for some other species of *Tetrastichus*. Pletsch (1947) reported that in the laboratory *Tetrastichus triozae* females temporarily paralyzed the nymphs of *Paratrioza cockerelli* (Sule) and then laid eggs on the ventral surface of the psyllid nymph's body—usually to one side of the mid-ventral line between the legs. He emphasized that, after hatching, the parasite larva remained outside the body wall of the nymph during its feeding and development, but cut its emergence hole through the dorsal surface of the nymphal shell.

In the present study *Tetrastichus triozae* has been reared from the nymphs of at least nine additional species of psyllids. In these cases the evidence also



indicates that the parasite larva develops outside of the host body. In a number of instances the adult parasite was able to push the nymphal shell up enough to get out without cutting a hole through the integument of the nymph. In most cases, however, the nymphal shell becomes attached to the host plant by strands of an adhesive material, as previously observed by Pletsch (1947), who suggested that this resulted from the action of the parasite. This is an adaptation which insures protection for the parasite between the substratum and the nymphal shell during pupation. Parasites which develop and pupate within the body cavity of the psyllid nymph continue to have a measure of protection even if the parasitized nymph becomes dislodged from its host.

An unidentified species of *Tetrastichus* was collected while the larva was clearly attached to the outside venter of the nymph of *Arytaina bicolor* Jensen. Six days after collection, the larva pupated between the body of the nymph and the wall of the glass vial in which they were enclosed.

Only one adult parasite develops in a single nymph in nearly all cases. Two exceptions were encountered during this study. Two adult *Prionomitus mitratus* emerged from the same nymph of *Arytaina essigi* and three adults of *Aphycus* sp. were reared from a single nymph of *Trioza minuta arizonae* Aulmann.

**Emergence of parasites.** Typically, the parasite pupates in such a position that it lies on its back with its head in the abdomen of the psyllid nymph. When ready to emerge the parasite cuts a circular hole in the dorsal surface of the psyllid's abdomen. Occasionally emergence of *Tetrastichus* spp. was observed to be through a hole in the head or thorax of the nymph. The emergence of an adult of *Prionomitus* sp. was observed July 12, 1949. Parasitized nymphs of *Arytaina robusta* Crawford had been collected June 27. A round hole was chewed in the venter rather than in the dorsum of the nymph's abdomen because the parasitized nymph had been detached from its host and was lying on its back in the vial. The parasite attempted to emerge several times before it had cut the hole large enough to allow passage of the head and antennae. The material bitten off in making the hole was swallowed by the parasite.

**Parasite distribution.** *Prionomitus mitratus* is the only parasite species recorded from psyllids in both the New World and Europe. The first specimens of this species identified from America were among the psyllid parasites reared during this study. Of the 22 genera of hymenopterous parasites of the Psyllidae recorded in Table 1, seven genera are known only from North America, nine are known only from outside of the Americas and the distribution of six genera includes the New World and other regions.

**Levels of Parasitism.** Most of the psyllid species are not heavily parasitized as a general rule. At times, however, the proportion parasitized becomes relatively high. This has been determined most conclusively for certain of the economic species. In 1939 Pletsch (1947) found 23 per cent of the nymphs of *Paratrioza cockerelli* parasitized at Billings, Montana. No parasites were found among heavy psyllid infestations in other localities.

*Eurytoma* sp. was reported parasitizing 18.4 per cent of 365 nymphs of *Pachypsylla celtidis-inteneris* Mally (Smith and Taylor, 1953) in Kansas

and Walton (1944) found the same hackberry psyllid parasitized to the extent of 31.6 per cent by *Psyllaephagus pachypsyllae* (Howard) in New York City.

Husain and Nath (1924) reported that in India as many as 95 per cent of the nymphs of the citrus pest, *Diaphorina citri* (Kuw.), were parasitized at some localities by several species of parasites. The most important parasite, and the only one identified, was *Tetrastichus radiatus* Waterston.

**Host Relationships of Parasitic Genera and Species.** The parasitic species reared from psyllid nymphs appear to be predominantly if not exclusively parasitic on the Psyllidae. An exception may be *Tetrastichus sicarius* Silvestri which is reported to have been reared from *Coccus viridis* Green in Africa and Mauritius as well as from the "Citrus Psylla," presumably *Trioza citri* Laing.

*Asaphes vulgaris* Walker (Pteromalidae) has been listed in the literature as emerging from aphids in several genera, aphidiids, and Curculionidae as well as from the apple psylla, *Psylla mali* (Schmidb.). However, these records cannot be interpreted literally because as Lal (1934) indicated, *Asaphes vulgaris* has been shown to be a hyperparasite.

The host specificity of some of the parasitic Hymenoptera attacking the Psyllidae is difficult to evaluate because in many cases only one record of parasitism has been published for some of the parasite species. Psyllid parasites in the genera *Torymus* (*Callimome*) and *Eurytoma* have all been reared from the gall-forming psyllids of the genus *Pachypsylla*. Three species of *Alloxysta* were reared from three different species of psyllids but all three were in genus *Euphyllura*.

In contrast to the above evidence are rearing records which indicate that other parasites show relatively little selectivity among the psyllids. The encyrtid *Prionomitus mitratus* is now known to parasitize 17 species of psyllids in 4 genera. If the specimens now provisionally labelled as *Prionomitus* sp. also prove to be *P. mitratus*, as seems probable, the total will increase to at least 21 species. *Tetrastichus triozae* is recorded from 12 species in 7 genera.

Three different genera of parasites were reared from the nymphs of a single psyllid species collected at the same time and place.

The taxonomic position of parasites reared from psyllid nymphs is given below with a brief discussion of the general host relationships of the genera. The categories have been arranged in alphabetical rather than in phylogenetic order. The host groups listed are not to be construed as complete; they represent the more common hosts or indicate the diversity of hosts.

Except for the dipterous gall midge genera *Endopsylla*, *Lestodiplosis*, and *Bremia*, all the parasites recorded from the Psyllidae occur in the order Hymenoptera. Moreover, all the hymenopterous parasites attack only the nymphal stages of the Psyllidae.

## HYMENOPTEROUS PARASITES<sup>a</sup>

### Superfamily Chalcidoidea

**Encyrtidae.** This family includes a large number of species most of which develop as internal parasites of the Homoptera, Hymenoptera, Lepidoptera,

<sup>a</sup> The names used in this paper follow Muesebeck, Krombein, and Townes (1951).



Coleoptera, Diptera, Neuroptera, and less frequently in other insect orders and in ticks (Clausen, 1940).

*Aphycus*. Host records for *Aphycus* refer almost exclusively to coccids or to chalcidoid parasites of coccids. Exceptions include two records from the Psyllidae. One of these concerns *Aphycus* (*Metaphycus*) *psyllidis* (Compere) which was found parasitizing the nymphs of the potato psyllid, *Paratrioza cockerelli* (Sule) in California.

*Cercobelus*. The species *C. jugaeus* Walker has been recorded once as a parasite of the psyllid *Psyllopsis fraxinicola* (Förster) in Scotland. Other host records for the genus have not been found.

*Cheiloneurus*. The insect hosts of this genus are principally primary parasites of soft scales and other Homoptera. Two psyllid species have also been recorded as hosts, but it is probable that the *Cheiloneurus* were secondary parasites in these instances.

*Encyrtus*. The hosts of this genus include the Psyllidae, Diptera, Lepidoptera, and Coleoptera, in addition to the soft scales which are the most common hosts.

*Metallon*. This genus appears to be recorded only from the Psyllidae.

*Mirocerus*. This genus was described (Ashmead, 1904) for a parasite reared from a psyllid. The original publication lists the type species as "*peyela*." However, Gahan and Peck (1946) point out that this was a typographical error because the type, in the U.S. National Museum, is plainly labeled "*psyllae*."

*Prionomitus*. This genus appears to be parasitic principally on psyllids although it has also been recorded from *Lecanium*. Among the Psyllidae, *Prionomitus mitratus* is recorded from at least 13 species in four genera.

*Psyllaephagus*. The 10 named species in this genus were all reared from the Psyllidae. In the present study, undescribed species of *Psyllaephagus* were reared from 10 species in seven genera of psyllids.

*Psylledontus*. Three parasite species in the genus *Psylledontus* have been reared from three different species of psyllids in Ceylon, Japan, and New York, respectively.

*Psylencyrtus*. This monotypic genus was described in 1955 for a new parasite species reared from the psyllid, *Syntomoza magna* Kuwayama.

## EULOPHIDAE

*Aphelinus* (*Agonioneurus*). Members of the genus *Aphelinus* are principally parasitic on aphids, but species have also been reported from Psyllidae, Coccidae, and even Coleophoridae.

*Aprostocetus*. This genus is predominantly parasitic on gall midges, but one species was reared from a psyllid and other records indicate Orthoptera, Lepidoptera, and Coleoptera may be hosts.

*Pteroptrix*. The only host record found for this genus listed the psyllid *Rhinocola eucalypti* Mask. in New Zealand.

*Tetrastichus*. The arthropod host list of the genus *Tetrastichus* is very extensive. The major groups listed by Burks (1943) as being parasitized by *Tetrastichus* are Orthoptera, Odonota, Thysanoptera, Homoptera, Neuroptera, Coleoptera, Lepidoptera, Diptera, Hymenoptera, and Araneae. At least eight species are now known to parasitize over 20 species of psyllids. Waterston (1922) thought the *Tetrastichus* species might be secondary rather than

primary parasites. There can be no question, however, regarding the primary parasitic status of *T. triozae*.

### **EUELMIDAE**

*Eupelmus*. Certain species in this genus are normally primary parasites but may also develop as hyperparasites. Only one record is available indicating psyllids as hosts. Moser (1956) reported that *Eupelmus* sp. had been observed ovipositing in the galls of *Pachypsylla celtidis-vesicula* Riley in Ohio.

### **EURYTOMIDAE**

*Eurytoma*. Like the genus *Torymus*, *Eurytoma* species are primarily parasitic on gall-forming insects such as the Cynipidae, some of the Diptera, Lepidoptera, and Coleoptera. It is of interest that the psyllids attacked by both genera (*Torymus* and *Eurytoma*) occur in the *Pachypsylla* which form galls on hackberry (*Celtis* spp.).

### **PTEROMALIDAE**

*Amblymerus*. One record was found of a species of *Amblymerus* being reared from psyllids. Other parasitic records report various Coleoptera, Lepidoptera, Hymenoptera, and Diptera as hosts.

*Asaphes*. Species of this genus have been recorded from aphids, psyllids (one record), mealybugs, parasitic Hymenoptera, Coleoptera, and Diptera. However, it is questionable whether *A. vulgaris* Walker actually is a primary parasite of psyllids because this species has been shown to be a hyperparasite (Lal, 1934).

*Pachyneuron*. Three species of *Pachyneuron* have been described as parasites of Psyllidae. Other recorded hosts of the genus have been reported among the aphids, coccids, Neuroptera, Hymenoptera, Coleoptera, Lepidoptera, and Diptera.

### **THYSANIDAE**

*Thysanus* (*Signiphora*). Members of this genus have been recorded most frequently from Aleyrodidae, Coccidae, and Pseudococcidae, and in one instance each from Psyllidae and Aphididae. However, Clausen (1940) considers it probable that they are predominantly hyperparasitic in habit.

### **TORYMIDAE**

*Torymus* (*Callimome*). This genus is parasitic principally on insects causing plant galls, such as the Cynipidae, but other host records exist among the Diptera, Lepidoptera, Coleoptera, and Homoptera. Two species attack psyllids of the genus *Pachypsylla* in North America. Both of these species of Psyllidae cause galls on hackberry (*Celtis* spp.)

## **Superfamily Cynipoidea**

### **CYNIPIDAE**

*Alloxysta*. Three species of *Alloxysta* have been recorded from the Psyllidae. Although one species is widely separated geographically from the other two (Eritrea and California, respectively), all three of the host species belong to the genus *Euphyllura*. *Alloxysta* has also been recorded from aphids as secondary braconid parasites. They may also be secondary parasites when reared from psyllids.



## Superfamily Ichneumonoidea

### BRACONIDAE

*Aphidius*. Almost all of the known hosts of *Aphidius* spp. are aphids. In addition, there is a single record from the Psyllidae.

## Superfamily Proctotrupoidea

### CERAPHRONIDAE

*Lygocerus*. This genus is considered by Clausen (1940) and Lal (1934) to be primarily hyperparasitic on mealybugs, aphids, psyllids, and perhaps other Homoptera. In Scotland Lal (1934) reared *Lygocerus semiramosus* Kieffer from parasitized nymphs of *Psylla peregrina* Först. However, he believed these to be secondary in the psyllid and primary in the encyrtid *Prionomitus mitratus* which was parasitizing 20 to 30 per cent of the nymphs.

### PLATYGASTERIDAE

*Platygaster*. Species of *Platygaster* are characteristically parasitic on gall-producing insects, particularly the Itonididae. Other hosts include Lepidoptera, Coleoptera, Coccidae, and Psyllidae.

## DIPTEROUS PARASITES

**Itonididae.** Although the great majority of gall midges are phytophagous, the family includes approximately 50 species whose larvae are known to be predaceous and three species in two genera whose larvae are endoparasites.

Barnes (1930 and 1954) has reviewed the zoophagous gall midges in detail. Approximately 40 species of midge larvae are predaceous on scale insects and a few species have been recorded as predators of the Aphididae, Tingidae, Aleyrodidae, and Psyllidae.

In contrast to the hymenopterous parasites of the Psyllidae which always attack the nymphs, the gall midges attack the psyllid adults and, in some cases, perhaps also nymphs.

*Endopsylla*. The genus includes endoparasites of adult psyllids and tingids. *Endopsylla agilis* de Meijere was reported by de Meijere (1907) to parasitize *Psylla foersteri* Flor on alder in Holland, with from one to four parasites being reared from a single psyllid. Bagnall and Harrison (1924) recorded this parasite from the same psyllid species in England. In Germany, Speyer (1929 and 1941) reported that 19 per cent of the adults of the apple sucker, *Psylla mali* (Schmidb.), were parasitized by an *Endopsylla* which was provisionally identified as *E. agilis*.

Lal (1934) studied the biology of an *Endopsylla* species in Scotland which Barnes (1954) thinks may prove to be *E. agilis*. The eggs are laid on the forewings of the psyllid, hatch in 8 to 13 days, feed for 3 or 4 days as ectoparasites, and then burrow into the haemocoel of the host. He recorded the species as a parasite of *Psylla melanoneura* Foerst., *P. pyricola* Foerst., *P. mali*, and *P. peregrina*. Parasitization of the last species ranged between 20 and 40 per cent. The affected psyllids became swollen and sluggish but did not change color.

*Lestodiplosis* and *Bremia*. The larvae of these genera are predatory. *Lestodiplosis liviae* Rübs. was described from specimens which Rübsaamen (1901) reared from the galls of *Livia juncorum* Latr. in Germany. He stated that the gall midge larvae feed on the larvae of *Livia juncorum*. Kieffer

(1901) reported an undetermined species of *Lestodiplosis* which "lives at the expense of *Aphalara maculipennis* Fr. Lw." and that Rübssaamen had observed a species of *Bremia* in the galls of *Psyllopsis fraxini* (L.).

TABLE 1  
SUMMARY OF PARASITES REARED FROM PSYLLID NYMPHS\*

Parasite	Host species	Region	Reference
<b>HYMENOPTERA</b>			
<b>SUPERFAMILY CHALCIDOIDEA</b>			
<b>Encyrtidae:</b>			
<i>Aphycus</i> ( <i>Metaphycus</i> ) <i>psyllidis</i>			
(Compere).....	<i>Paratrioza cockerelli</i> (Sulc)	California	Compere, 1943
<i>Aphycus</i> sp.....	<i>Trioxa minuta arizonae</i> Aulmann	California	Present paper
<i>Cercobelus jugaeus</i> Walker.....	<i>Psyllopsis fraxinicola</i> Först.	Scotland	Lal, 1934
<i>Cheiloneurus praeitens</i> Waterston.....	Psyllid gall (? <i>Trioxa</i> sp.)	Jamaica	Waterston, 1922
<i>Cheiloneurus</i> sp.....	<i>Arytaina amorphae</i> (Mally)	California	Present paper
<i>Encyrtus pulvinatus</i> Waterston.....	<i>Trioxa citri</i> Laing	Kenya	Waterston, 1922
<i>Encyrtus trioxae</i> André.....	<i>Trioxa centranthi</i> Vallot	France	André, 1878
<i>Encyrtus</i> sp.....	<i>Psylla pyricola</i> Först.	Russia	Yakhontov, 1929
<i>Metallon</i> ( <i>Trechmites</i> ) <i>psyllae</i> Ruschka.....	<i>Psylla pyricola</i> Först.	Germany	Ruschka, 1923
<i>Mirocerus psyllae</i> Ashm.....	Psyllid	Ceylon	Ashmead, 1904 Gahan & Peck, 1946
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Arytaina essigi</i> Jensen	California	Present Paper
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Arytaina fuscipennis</i> Crawl.	Utah	Present paper
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Arytaina insolita</i> Tut.	California	Present paper
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Arytaina minuta</i> Crawl.	California	Present paper
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Arytaina "robusta"</i> Crawl.	California	Present paper
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Pezopsylla cercocarpi</i> Jensen	California	Present paper
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Psylla americana</i> Crawl.	California	Present paper
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Psylla crataegi</i> (Schränk)	Switzerland	Wille, 1950
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Psylla melanoneura</i> Först.	Switzerland	Wille, 1950
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Psylla near media</i> Tuthill	California	Present paper
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Psylla peregrina</i> Först.	Scotland	Lal, 1934
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Psylla pyri</i> (L.)	Switzerland	Wille, 1950
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Psylla pyricola</i> Först.	Switzerland	Wille, 1950
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Psylla pyrisuga</i> Först.	France	Ferrière, 1926
		Switzerland	Brocher, 1926 Wille, 1950
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Psylla retamae</i> Put.	Spain	Mercet, 1926
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Psylla ribesiae</i> (Crawl.)	New Mexico	Jensen, 1956
<i>Prionomitus mitratus</i> (Dalm.).....	<i>Trioxa beameri</i> Tuthill	California	Present paper
<i>Prionomitus</i> sp.....	<i>Arytaina bicolor</i> Jensen	California	Present paper
<i>Prionomitus</i> sp.....	<i>Arytaina "robusta"</i> Crawl.	California	Present paper
<i>Prionomitus</i> sp.....	<i>Psylla americana</i> Crawl.	California	Jensen, 1951
<i>Prionomitus</i> sp.....	<i>Psylla brevata</i> Patch	California	Jensen, 1951 Present paper
<i>Prionomitus</i> sp.....	<i>Psylla floccosa</i> Patch	California	Present paper
<i>Prionomitus</i> sp.....	<i>Psylla mali</i> (Schmidb.)	Poland	Woroniecka, 1928
<i>Prionomitus</i> sp.....	<i>Psylla pyricola</i> Först.		Grandi, 1951
<i>Prionomitus</i> sp.....	<i>Psylla tenuata</i> Jensen	California	Jensen, 1951
<i>Prionomitus</i> sp.....	<i>Psylla</i> sp.	Iran	Kiriukhin, 1946
<i>Psyllaephagus arbuticola</i> Gahan & Waterston.....	<i>Euphyllura arbuti</i> Schw.	California	Gahan & Waterston, 1926
<i>Psyllaephagus cellulatus</i> Waterston.....	<i>Rhinocola populi</i> Laing	Mesopotamia	Waterston, 1922
<i>Psyllaephagus euphyllurae</i> (Masi).....	<i>Euphyllura olivina</i> (Costa)	Italy, Sicily, Portugal	Masi, 1911; Gahan & Waterston, 1926
<i>Psyllaephagus femoralis</i> Borelli.....	<i>Trioxa alacris</i> Flor	Italy	Borelli, 1920
<i>Psyllaephagus iwayaensis</i> Ishii.....	Psyllid on <i>Cinnamomum</i> sp.	Japan	Ishii, 1928
<i>Psyllaephagus metallicus</i> (Girault).....	"Bred out of <i>Eucalyptus</i> "	Australia	Girault, 1915a
<i>Psyllaephagus pachypsyllae</i> (Howard).....	<i>Pachypsylla celtidis-gemma</i> Riley	Maryland	Howard, 1885
<i>Psyllaephagus pachypsyllae</i> (Howard).....	<i>Pachypsylla venusta</i> O.S.	Kansas	Smith & Taylor, 1953

\* Except *Endopsylla* (Itonididae: Diptera) which were reared from psyllid adults.



TABLE 1 (continued)

Parasite	Host species	Region	Reference
<b>Encyrtidae—(Cont'd.)</b>			
<i>Psyllaephagus pachypsyllae</i> (Howard)...	<i>Trioza beameri</i> Tuthill	California	Present paper
<i>Psyllaephagus</i> sp. near <i>pachypsyllae</i> (Howard).....	<i>Pachypsylla venusta</i> O.S. or <i>P. celtidis-vesicula</i> Cr.	Idaho	Jensen, 1946
<i>Psyllaephagus phytolymae</i> Ferrière.....	<i>Phytolyma lata</i> Scott	Nigeria	Ferrière, 1931
			Vosseler, 1906
		Gold Coast	Anon., 1940
<i>Psyllaephagus solus</i> (Howard).....	<i>Trioza magnoliae</i> (Ashm.)	Florida	Howard, 1885
<i>Psyllaephagus triozeiphagus</i> (Howard)...	<i>Trioza diospyri</i> (Ashm.)	Washington, D.C.; Ohio	Howard, 1885;
			Caldwell, 1938
<i>Psyllaephagus</i> sp.....	<i>Aphalara suaeae</i> Crawf.	California	Present paper
<i>Psyllaephagus</i> sp.....	<i>Aphalaroida pithecolobia</i> Crawf.	California	Present paper
<i>Psyllaephagus</i> sp.....	<i>Arytaina aculeata</i> Crawf.	California	Present paper
<i>Psyllaephagus</i> sp.....	<i>Arytaina amorphae</i> (Mally)	California	Present paper
<i>Psyllaephagus</i> sp.....	<i>Arytaina ceanothi</i> Crawf.	California	Present paper
<i>Psyllaephagus</i> sp.....	<i>Arytaina "robusta"</i> Crawf.	California	Present paper
<i>Psyllaephagus</i> sp.....	<i>Euphyllura arbuti</i> Schwarz	California	Present paper
<i>Psyllaephagus</i> sp.....	<i>Pezopsylla cercocarpi</i> Jensen	California	Present paper
<i>Psyllaephagus</i> sp.....	<i>Psylla minuta</i> Crawf.?	California	Present paper
<i>Psyllaephagus</i> sp.....	<i>Psylla pyricola</i> Först.	Italy	Golfari, 1937
			Grandi, 1951
<i>Psyllaephagus</i> sp.....	<i>Trioza bakeri</i> Crawf.	California	Present paper
<i>Psylledontus insidiosus</i> Crawford,.....	<i>Psylla pyricola</i> Först.	New York	Crawford, 1911;
			Anon., 1931
		Connecticut	Garman & Townsend, 1941
<i>Psylledontus secundus</i> Girault.....	Gall-making psyllid	Ceylon	Girault, 1915
<i>Psylledontus viridiscutellatus</i> Ishii.....	Psyllid on <i>Elaeagnus</i> sp.	Japan	Ishii, 1928
<i>Psylencyrtus syntomozae</i> Tachikawa.....	<i>Syntomoza magna</i> Kuwayama	Japan	Tachikawa, 1955
(Undetermined).....	<i>Trioza vitreoradiata</i> (Mask.)	New Zealand	Carter, 1949
<b>Eulophidae:</b>			
<i>Aphelinus</i> ( <i>Agonioneurus</i> ) <i>pictus</i> †.....	<i>Trioza centranthi</i> Vallot	France	André, 1878
<i>Aprostocetus phytolymae</i> Risbec.....	<i>Phytolyma lata</i> var. <i>fusca</i> Alibert	Gold Coast	Anon. 1940
			Alibert, 1947
<i>Aprostocetus roseveari</i> Ferrière.....	<i>Phytolyma lata</i> Scott	Nigeria?	Risbec, 1947
? <i>Chrysoscharoideus</i> sp.....	<i>Pachypsylla celtidis-vesicula</i> Crawf.	Nigeria	Ferrière, 1931
		Ohio	Moser, 1956
		New York	Moser, 1956
<i>Pteroptrix maskelli</i> Ashm.....	<i>Rhinocola eucalypti</i> Mask.	New Zealand	Gourlay, 1930
<i>Tetrastichus clypeatus</i> Gahan.....	<i>Dynopsylla robusta</i> Crawf.	Philippines	Gahan, 1925
<i>Tetrastichus dryi</i> Waterston.....	<i>Trioza citri</i> Laing	Kenya	Waterston, 1922
<i>Tetrastichus dyrus</i> Burks.....	<i>Trioza</i> sp.	Montana	Burks, 1943
<i>Tetrastichus gelastus</i> Burks.....	<i>Trioza</i> sp.	Florida	Burks, 1943
<i>Tetrastichus obscuratus</i> André.....	<i>Trioza centranthi</i> Vallot	France	André, 1878
	<i>Trioza urticae</i> L.	Italy	Grandi, 1953
			Zangheri, 1954
<i>Tetrastichus radiatus</i> Waterston.....	<i>Diaphorina citri</i> (Kuw.)	India	Hussain & Nath, 1927
<i>Tetrastichus sicarius</i> Silvestri.....	"Citrus Psylla"	Kenya	Waterston, 1922
<i>Tetrastichus triozae</i> Burks.....	<i>Arytaina minuta</i> Crawf.	California	Present paper
<i>Tetrastichus triozae</i> Burks.....	<i>Calophya californica</i> Schw.	California	Present paper
<i>Tetrastichus triozae</i> Burks.....	<i>Calophya nigrella</i> Jensen	California	Present paper
<i>Tetrastichus triozae</i> Burks.....	? <i>Calophya nigripennis</i> Riley	Kansas	Burks, 1943
<i>Tetrastichus triozae</i> Burks.....	<i>Calophya triozomima</i> Schw.	California	Present paper
<i>Tetrastichus triozae</i> Burks.....	<i>Euphalerus vermiculosus</i> Crawf.	California	Present paper
<i>Tetrastichus triozae</i> Burks.....	<i>Pezopsylla cercocarpi</i> Jensen	California	Present paper

† Bred from the same nymph that gave rise to *Encyrtus triozae* and thought by André to be a hyperparasite.

TABLE 1 (continued)

Parasite	Host species	Region	Reference
<b>Eulophidae—(Cont'd.)</b>			
<i>Tetrastichus triozae</i> Burks.....	<i>Paratrioza cockerelli</i> (Sulc)	Arizona New Mexico Colorado Nebraska Montana	Burks, 1943 Burks, 1943 Burks, 1943 Burks, 1943 Pletsch, 1947
<i>Tetrastichus triozae</i> Burks.....	<i>Trioxa albifrons</i> Crawl.	California	Present paper
<i>Tetrastichus triozae</i> Burks.....	<i>Trioxa beameri</i> Tuthill	California	Present paper
<i>Tetrastichus triozae</i> Burks.....	Amelanchier psyllid ? ( <i>Trioxa</i> sp.)	Washington	Burks, 1943
<i>Tetrastichus</i> sp.....	<i>Arytaina bicolor</i> Jensen	California	Present paper
<i>Tetrastichus</i> sp.....	<i>Pezopsylla cercocarp</i> Jensen	California	Present paper
<i>Tetrastichus</i> sp.....	<i>Paratrioza maculipennis</i> (Crawl.)	California	Present paper
<i>Tetrastichus</i> 2 spp.....	<i>Phytolyma lata</i> Scott	Gold Coast	Anon., 1940
<i>Tetrastichus</i> sp.....	<i>Trioxa bakeri</i> Crawl.	California	Present paper
<i>Tetrastichus</i> sp.....	<i>Trioxa maura</i> Först.	California	Present paper
<i>Tetrastichus</i> sp.....	<i>Trioxa viridula</i> Zett.	Latvia	Ozols, 1925
<i>Tetrastichinae</i> near <i>Quadrastichodella</i> Gir.....	<i>Pachyphylla celtidis-vesicula</i> Crawl.	Ohio	Moser, 1956
<b>Eupelmidae:</b>			
<i>Eupelmus</i> sp.....	<i>Pachyphylla celtidis-vesicula</i> Crawl.	Ohio	Moser, 1956
<b>Eurytomidae:</b>			
<i>Eurytoma flavovultus</i> Bugbee.....	<i>Pachyphylla venusta</i> O.S.	Texas	Bugbee, 1957
<i>Eurytoma levivultus</i> Bugbee.....	<i>Pachyphylla celtidis-gemma</i> Riley	Ohio	Bugbee, 1957
<i>Eurytoma semivenae</i> Bugbee.....	<i>Pachyphylla celtidis-vesicula</i> Crawl.	Arkansas Kansas New York Ohio Texas	Bugbee, 1957 Bugbee, 1957 Bugbee, 1957 Bugbee, 1957 Bugbee, 1957
<i>Eurytoma</i> sp.....	<i>Pachyphylla celtidis-inteneris</i> Mally	Kansas	Smith & Taylor, 1953
<i>Eurytoma</i> sp.....	<i>Pachyphylla venusta</i> O.S.....	Kansas	Smith & Taylor, 1953
<i>Eurytoma</i> sp.....	<i>Pachyphylla venusta</i> O.S. or <i>P.</i> <i>celtidis-vesicula</i> Crawl.	Idaho	Jensen, 1946
<b>Pteromalidae:</b>			
<i>Amblymerus</i> sp.....	<i>Pachyphylla venusta</i> O.S.	Utah	Knowlton, 1933
<i>Asaphes vulgaris</i> Walker.....	<i>Psylla peregrina</i> Först.	Scotland	Lal, 1934
<i>Pachyneuron crassiculme</i> Waterston.....	<i>Rhinocola populi</i> Laing	Mesopotamia	Waterston, 1922
<i>Pachyneuron psyllaephaga</i> Mani.....	<i>Psylla peregrina</i> Först.	Scotland	Lal, 1934 Mani, 1939
<i>Pachyneuron validum</i> Waterston.....	<i>Euphyllura arbuti</i> Schw.	California	Waterston, 1923
<i>Pachyneuron</i> sp.....	<i>Arytaina ceanothi</i> Crawl.	California	Present paper
(Undetermined).....	<i>Psylla pyricola</i> Först.	Italy	Grandi, 1951
	<i>Psylla brevistigmata</i> Crawl.	California	Present paper
<b>Thysanidae:</b>			
<i>Thysanus</i> ( <i>Signiphora</i> ) <i>noaki</i> (Ashm.)...	<i>Psylla</i> sp.	Brazil	Ashmead, 1900
<i>Thysanus</i> ( <i>Signiphora</i> ) <i>unifasciatus</i> (Ashm.).....	<i>Ceropsylla sideroxyli</i> Crawl.	Florida	Ashmead, 1900
<b>Torymidae:</b>			
<i>Torymus</i> ( <i>Callimome</i> ) <i>pachyphyllae</i> (Ashm.).....	<i>Pachyphylla celtidis-gemma</i> Riley	Illinois	Lienk, 1951
	<i>Pachyphylla venusta</i> O.S.	Connecticut	Viereck, 1916
<i>Torymus</i> ( <i>Callimome</i> ) <i>scalaris</i> (Huber)...	<i>Pachyphylla celtidis-gemma</i> Riley	Kansas	Smith & Taylor, 1953
		Arizona	Huber, 1927
		California?	Huber, 1927



TABLE 1 (continued)

Parasite	Host species	Region	Reference
<b>Torymidae—(Cont'd.)</b>			
<i>Torymus (Callimome) sp. near scalaris</i> .....	<i>Pachypsylla venusta</i> O.S. or <i>celtidis-vesicula</i> Crawl.	Idaho	Jensen, 1946
<i>Torymus vesiculi</i> Moser.....	<i>Pachypsylla celtidis-vesicula</i> Crawl.	Ohio	Moser, 1956
<b>Chalcidoidea:</b>			
(Undetermined species).....	<i>Apsylla cistellata</i> (Buckton)	India	Mathur, 1935
	<i>Cerotriza sp.</i>	India	Mathur, 1935
	<i>Euphalerus vittatus</i> Crawl.	India	Mathur, 1935
	<i>Paurocephala sp.</i>	India	Mathur, 1935
	<i>Pauropsylla beesoni</i> Laing	India	Mathur, 1935
	<i>Pauropsylla depressa</i> Crawl.	India	Mathur, 1935
	<i>Phacopteron lentiginosum</i> Buck.	India	Mathur, 1935
	<i>Psylla sp.</i>	India	Mathur, 1935
	<i>Tenaphalara acutipennis</i> Kuw.	India	Mathur, 1935
	<i>Trioza fletcheri minor</i> Crawl.	India	Mathur, 1935
	<i>Trioza gardneri</i> Laing	India	Mathur, 1935
	<i>Trioza hirsuta</i> (Crawl.)	India	Mathur, 1935
	<i>Trioza jambolanae</i> Crawl.	India	Mathur, 1935
	<i>Trioza mallotica</i> (Crawl.)	India	Mathur, 1935
	<i>Trioza merwei</i> Pettey	South Africa	Merwe, 1923
	<i>Trioza spp.</i>	India	Mathur, 1935
<b>SUPERFAMILY CYNIPOIDEA</b>			
<b>Cynipidae:</b>			
<i>Allozysta eleaphila</i> Silv.....	<i>Euphyllura olivina</i> (Costa)		Grandi, 1951
<i>Allozysta peraperta</i> Silv.....	<i>Euphyllura aethiopica</i> Silv.	Eritrea	Silvestri, 1915
<i>Allozysta sp.</i> .....	<i>Euphyllura arbuti</i> Schw.	California	Ferris & Hyatt, 1923
<b>SUPERFAMILY ICHNEUMONOIDEA</b>			
<b>Braconidae:</b>			
<i>Aphidius polygoni</i> Marsh.....	<i>Trioza alacris</i> Flor	Germany	Wagner, 1929
<b>SUPERFAMILY PROCTOTRUPOIDEA</b>			
<b>Ceraphronidae:</b>			
<i>Lygocerus semiramosus</i> Kieffer.....	<i>Psylla peregrina</i> Först.	Scotland	Lal, 1934
<b>Platygastridae:</b>			
<i>Platygastr sp.</i> .....	<i>Psylla peregrina</i> Först.	Scotland	Lal, 1934
<b>DIPTERA</b>			
<b>Itonididae:</b>			
<i>Bremia sp.</i> .....	<i>Psyllopsis frazini</i> (L.)	Germany	Kieffer, 1901
<i>Endopsylla agilis</i> de Meijere.....	<i>Psylla försteri</i> Flor	Holland	de Meijere, 1907
	<i>Psylla mali</i> (Schmidb.)	England	Bagnall & Harrison, 1924
<i>Endopsylla</i> probably <i>agilis</i> de Meijere ..	<i>Psylla mali</i> (Schmidb.)	Germany	Speyer, 1929; 1941
		Scotland	Lal, 1934
	<i>Psylla melanoneura</i> Först.	Scotland	Barnes, 1954
			Lal, 1934
	<i>Psylla peregrina</i> Först.	Scotland	Barnes, 1954
			Lal, 1934
	<i>Psylla pyricola</i> Först.	Scotland	Barnes, 1954
			Lal, 1934
<i>Lestodiplosis liviae</i> Rübsaamen.....	<i>Livia juncorum</i> Latr.	Germany	Rübsaamen, 1901
<i>Lestodiplosis sp.</i> .....	<i>Aphalara maculipennis</i> Lw.	Germany	Kieffer, 1901
(Undetermined).....	<i>Pachypsylla celtidis-vesicula</i> Crawl.	Ohio	Moser, 1956

TABLE 2

## PSYLLID SPECIES FROM WHICH PARASITES HAVE BEEN REARED

Host species	Parasite	Region	Reference
<i>Aphalara maculipennis</i> Loew.....	<i>Lestodiplosis</i> sp. (Itonididae)	Germany	Kieffer, 1901
<i>suaedae</i> Crawf.....	<i>Psyllaephagus</i> sp.	California	Present paper
<i>Aphalaroida pithecolobia</i> Crawf.....	<i>Psyllaephagus</i> sp.	California	Present paper
<i>Apsylla cistellata</i> (Buckt.).....	Chalcid. Undet.	India	Mathur, 1935
<i>Arytaina aculeata</i> Crawf.....	<i>Psyllaephagus</i> sp.	California	Present paper
<i>amorphae</i> (Mally).....	<i>Cheiloneurus</i> sp.	California	Present paper
<i>bicolor</i> Jensen.....	<i>Prionomitus</i> sp.	California	Present paper
	<i>Tetrastichus</i> sp.	California	Present paper
<i>ceanothi</i> Crawf.....	<i>Prionomitus mitratus</i> (Dalm.)	California	Present paper
	<i>Psyllaephagus</i> sp.	California	Present paper
	<i>Pachyneuron</i> sp.	California	Present paper
	<i>Tetrastichus triozae</i> Burks	California	Present paper
<i>essigi</i> Jensen.....	<i>Prionomitus mitratus</i> (Dalm.)	California	Present paper
<i>fuscipennis</i> Crawf.....	<i>Prionomitus mitratus</i> (Dalm.)	Utah	Present paper
<i>insolita</i> Tuthill.....	<i>Prionomitus mitratus</i> (Dalm.)	California	Present paper
<i>minuta</i> Crawf.....	<i>Prionomitus mitratus</i> (Dalm.)	California	Present paper
	<i>Tetrastichus triozae</i> (Burks)	California	Present paper
<i>Arytaina "robusta" complex</i> .....	<i>Prionomitus mitratus</i> (Dalm.)	California	Present paper
	<i>Prionomitus</i> sp.	California	Present paper
	<i>Psyllaephagus</i> sp.	California	Present paper
<i>Calophya californica</i> Schw.....	<i>Tetrastichus triozae</i> Burks	California	Present paper
<i>nigrella</i> Jensen.....	<i>Tetrastichus triozae</i> Burks	California	Present paper
<i>?nigripennis</i> Riley.....	<i>Tetrastichus triozae</i> Burks	Kansas	Burks, 1943
<i>triozomima</i> Schw.....	<i>Tetrastichus triozae</i> Burks	California	Present paper
<i>Ceropsylla siderozyli</i> Riley.....	<i>Thysanus</i> ( <i>Signiphora</i> ) <i>unifasciatus</i> (Ashm.)	Florida	Ashmead, 1900
<i>Cerotrioza</i> sp.....	Chalcid. Undet.	India	Mathur, 1935
<i>Diaphorina citri</i> (Kuw.).....	<i>Tetrastichus radiatus</i> Waterston	India	Waterston, 1922
<i>Dynopsylla robusta</i> Crawf.....	<i>Tetrastichus clypeatus</i> Gahan	Philippines	Gahan, 1925
<i>Euphalerus vermiculosus</i> Crawf.....	<i>Tetrastichus triozae</i> Burks	California	Present paper
<i>vittatus</i> Crawf.....	Chalcid. Undet.	India	Mathur, 1935
<i>Euphyllura aethiopica</i> Silv.....	<i>Alloxysta peraperta</i> Silv.	Eritrea	Silvestri, 1915
<i>arbuti</i> Schwarz.....	<i>Alloxysta</i> sp.	California	Ferris & Hyatt, 1923
	<i>Pachyneuron validum</i> Waterston	California	Waterston, 1923
	<i>Psyllaephagus arbuticola</i> Gahan & Waterston	California	Gahan & Waterston, 1926
	<i>Psyllaephagus</i> sp.	California	Present paper
<i>olivina</i> (Costa).....	<i>Alloxysta eleaphila</i> Silv.		Grandi, 1951
	<i>Psyllaephagus euphylluræ</i> (Masi)	Italy	Masi, 1911
		Sicily;	Gahan & Waterston, 1926
		Portugal	Rübsaamen, 1901
<i>Livia juncorum</i> Latr.....	<i>Lestodiplosis liviae</i> Rübs.	Germany	
<i>Pachypsylla celtidis-gemma</i> Riley...	<i>Eurytoma levivultus</i> Bugbee	Ohio	Bugbee, 1957
	<i>Psyllaephagus pachypsyllae</i> (Howard)	Maryland	Howard, 1885
	<i>Psyllaephagus pachypsyllae</i> (Howard)	New York	Walton, 1944
	<i>Psyllaephagus pachypsyllae</i> (Howard)	Kansas	Smith & Taylor, 1953
	<i>Torymus</i> ( <i>Callimome</i> ) <i>pachypsyllae</i> (Ashm.)	Illinois?	Lienk, 1951



TABLE 2 (continued)

Host species	Parasite	Region	Reference
	<i>Torymus (Callimome) scalaris</i> (Huber)	North America	Huber, 1927
	<i>Torymus (Callimome) scalaris</i> (Huber)	Kansas	Smith & Taylor, 1953
<i>celtidis-inteneris</i> Mally.....	<i>Eurytoma</i> sp.	Kansas	Smith & Taylor, 1953
<i>celtidis-vesicula</i> Crawl. ....	? <i>Chrysocharoideus</i> sp.	Ohio	Moser, 1956
	<i>Eupelmus</i> sp.	New York	Moser, 1956
	<i>Eurytoma semivenae</i> Bugbee	Ohio	Moser, 1956
		Arkansas	Bugbee, 1957
		Kansas	Bugbee, 1957
		New York	Bugbee, 1957
		Ohio	Bugbee, 1957
		Texas	Bugbee, 1957
	Itonididae	Ohio	Moser, 1956
	Tetrastichinae near <i>Quadrastichodella</i>	Ohio	Moser, 1956
	<i>Torymus vesiculi</i> Moser	Ohio	Moser, 1956
<i>venusta</i> O.S.....	<i>Amblymerus</i> sp.	Utah	Knowlton, 1933
	<i>Eurytoma flavovultus</i> Bugbee	Texas	Bugbee, 1957
	<i>Eurytoma</i> sp.	Kansas	Smith & Taylor, 1953
	<i>Psyllaephagus pachypsyllae</i> (Howard)	Kansas	Smith & Taylor, 1953
	<i>Torymus (Callimome) pachypsyllae</i> (Ashm.)	Connecticut	Ashmead, 1888
<i>venusta</i> O.S. or <i>P. celtidis-vesicula</i> Crawl.....	<i>Eurytoma</i> sp.	Idaho	Viereck, 1916
			Jensen, 1946
			Present paper
	<i>Psyllaephagus</i> sp. near <i>pachypsyllae</i> (Howard)	Idaho	Jensen, 1946
	<i>Torymus (Callimome)</i> sp. near <i>scalaris</i> (Huber)	Idaho	Present paper
			Jensen, 1946
			Present paper
<i>Paratrioza cockerelli</i> (Sulc).....	<i>Aphycus (Metaphycus) psyllidis</i> Compere	California	Compere, 1943
	<i>Tetrastichus triozae</i> Burks	Arizona	Burks, 1943
		New Mexico	Burks, 1943
		Colorado	Burks, 1943
		Nebraska	Burks, 1943
		Montana	Pletsch, 1947
<i>maculipennis</i> (Crawl.).....	<i>Tetrastichus</i> sp.	California	Present paper
<i>Paurocephala</i> sp.....	Chalcid Undet.	India	Mathur, 1935
<i>Pauropsylla beesonii</i> Laing.....	Chalcid Undet.	India	Mathur, 1935
<i>depressa</i> Crawl.....	Chalcid Undet.	India	Mathur, 1935
<i>Pauropsylla</i> sp.....	Chalcid Undet.	India	Mathur, 1935
<i>Pezopsylla cercocarpi</i> Jensen.....	<i>Prionomitus mitratus</i> (Dalm.)	California	Present paper
	<i>Psyllaephagus</i> sp.	California	Present paper
	<i>Tetrastichus triozae</i> Burks	California	Present paper
	<i>Tetrastichus</i> sp.	California	Present paper
<i>Phacopteron lentiginosum</i> Buckton..	Chalcid Undet.	India	Mathur, 1935
<i>Phytolyma lata</i> Scott.....	<i>Aprostocetus roseveari</i> Ferrière	Nigeria	Ferrière, 1931
	<i>Psyllaephagus phytolymae</i> Ferrière	Nigeria	Ferrière, 1931
	<i>Tetrastichus</i> 2 spp.	Gold Coast	Anon., 1940
<i>lata</i> Scott var. <i>fusca</i> Alibert.....	<i>Aprostocetus phytolymae</i> Risbec	Nigeria ?	Risbec, 1947

TABLE 2 (continued)

Host species	Parasite	Region	Reference
<i>Psylla americana</i> Crawl.....	<i>Prionomitus mitratus</i> (Dalm.)	California	Present paper
	<i>Prionomitus</i> sp.	California	Jensen, 1951
<i>breviala</i> Patch.....	<i>Prionomitus</i> sp.	California	Jensen, 1951
			Present paper
<i>brevistigmata</i> Crawl.....	Pteromalidae (Undet.)	California	Present paper
<i>crataegi</i> (Schränk).....	<i>Prionomitus mitratus</i> (Dalm.)	Switzerland	Wille, 1950
<i>floccosa</i> Patch.....	<i>Prionomitus</i> sp.	California	Present paper
	Pteromalidae (Undet.)	California	Present paper
<i>foersteri</i> Flor.....	<i>Endopsylla agilis</i> de Meijere	Holland	de Meijere, 1907
	<i>Endopsylla agilis</i> de Meijere	England	Bagnall and Harrison, 1924
<i>malii</i> (Schmidb.).....	<i>Endopsylla agilis</i> ?	Scotland	Lal, 1934
			Barnes, 1954
<i>melanoneura</i> Först.....	<i>Prionomitus</i> sp.	Poland	Woroniecka, 1928
	<i>Endopsylla agilis</i> ?	Scotland	Lal, 1934
			Barnes, 1954
	<i>Prionomitus mitratus</i> (Dalm.)	Switzerland	Wille, 1950
? <i>minuta</i> Crawl.....	<i>Psyllaephagus</i> sp.	California	Present paper
near <i>media</i> Tuthill.....	<i>Prionomitus mitratus</i> (Dalm.)	California	Present paper
<i>peregrina</i> Först.....	<i>Endopsylla agilis</i> ?	Scotland	Lal, 1934
			Barnes, 1954
	<i>Asaphes vulgaris</i> Walker	Scotland	Lal, 1934
	<i>Lygocerus semiramosus</i> Kieff.	Scotland	Lal, 1934
	<i>Pachyneuron psyllaephaga</i> Mani	Scotland	Lal, 1934
	<i>Platygaster</i> sp.	Scotland	Lal, 1934
	<i>Prionomitus mitratus</i> (Dalm.)	Scotland	Lal, 1934
<i>pyri</i> (L.).....	<i>Prionomitus mitratus</i> (Dalm.)	Switzerland	Wille, 1950
<i>pyricola</i> Först.....	<i>Endopsylla agilis</i> ?	Scotland	Lal, 1934
			Barnes, 1954
	<i>Encyrtus</i> sp.	Russia	Yakhontov, 1929
	<i>Metallon</i> ( <i>Trechneites</i> ) <i>psyllae</i> Ruschka	Germany	Ruschka, 1923
	<i>Pachyneuron</i> sp.	Italy	Golfari, 1937
			Grandi, 1951
	<i>Prionomitus mitratus</i> (Dalm.)	Switzerland	Wille, 1950
	<i>Psylledontus insidiosus</i> Crawl.	New York	Crawford, 1911
			Anon., 1931
		Connecticut	Garman & Townsend, 1941
<i>pyrisuga</i> Först.....	<i>Prionomitus mitratus</i> (Dalm.)	France	Ferrière, 1926
	<i>Prionomitus mitratus</i> (Dalm.)	Switzerland	Brocher, 1926
			Wille, 1950
<i>relamae</i> Put.....	<i>Prionomitus mitratus</i> (Dalm.)	Spain	Marcet, 1926
<i>ribesiae</i> (Crawl).....	<i>Prionomitus mitratus</i> (Dalm.)	New Mexico	Jensen, 1956
<i>tenuata</i> Jensen.....	<i>Prionomitus mitratus</i> (Dalm.)	California	Jensen, 1951
<i>Psylla</i> sp.....	Chalcid Undet.	India	Mathur, 1935
<i>Psylla</i> sp.....	<i>Prionomitus</i> sp.	Iran	Kiriukhin, 1946
<i>Psylla</i> sp.....	<i>Thysanus</i> ( <i>Signiphora</i> ) <i>noacki</i> (Ashm.)	Brazil	Ashmead, 1900
<i>Psyllopsis frazzini</i> (L.).....	<i>Bremia</i> sp. (Itonididae)	Germany	Kieffer, 1901
<i>frazzinicola</i> Först.....	<i>Cercobelus jugueus</i> Walker	Scotland	Lal, 1934
<i>Rhinocola eucalypti</i> Mask.....	<i>Pteroptrix maskelli</i> Ashm.	New Zealand	Gourlay, 1930
<i>populi</i> Laing.....	<i>Psyllaephagus cellulatus</i> Waterston	Mesopotamia	Waterston, 1922
	<i>Pachyneuron crassiculme</i> Waterston	Mesopotamia	Waterston, 1922
<i>Syntomoza magna</i> Kuwayama.....	<i>Psyllencyrtus syntomozae</i> Tach.	Japan	Tachikawa, 1955



TABLE 2 (continued)

Host species	Parasite	Region	Reference
<i>Tenaphalara acutipennis</i> Kuw.....	Chalcid Undet.	India	Mathur, 1935
<i>Trioza alacris</i> Flor.....	<i>Aphidius polygoni</i> Marsh	Germany	Wagner, 1929
<i>albifrons</i> Crawl.....	<i>Psyllaephagus femoralis</i> Borelli	Italy	Borelli, 1920
<i>bakeri</i> Crawl.....	<i>Tetrastichus triozae</i> Burks	California	Present paper
	<i>Psyllaephagus</i> sp.	California	Present paper
<i>beameri</i> Tuthill.....	<i>Tetrastichus</i> sp.	California	Present paper
	<i>Prionomitus mitratus</i> (Dalm.)	California	Present paper
	<i>Psyllaephagus pachypsyllae</i> (Howard)	California	Present paper
<i>centranthi</i> Vallot.....	<i>Tetrastichus triozae</i> Burks	California	Present paper
	<i>Agonineurus pictus</i> Först.	France	André, 1878
	<i>Encyrtus triozae</i> André	France	André, 1878
	<i>Tetrastichus obscuratus</i> André	France	André, 1878
<i>citri</i> Laing.....	<i>Encyrtus pulvinatus</i> Waterston	Kenya	Waterston, 1922
	<i>Tetrastichus dryi</i> Waterston	Kenya	Waterston, 1922
	<i>Tetrastichus sicarius</i> Silvestri	Kenya	Waterston, 1922
<i>diospyri</i> (Ashm.).....	<i>Psyllaephagus trioziphagus</i> (Howard)	Washington, D.C.	Howard, 1885
<i>fletcheri minor</i> Crawl.....	Chalcid Undet.	India	Mathur, 1935
<i>gardneri</i> Laing.....	Chalcid Undet.	India	Mathur, 1935
<i>hirsuta</i> (Crawl.).....	Chalcid Undet.	India	Mathur, 1935
<i>jambolanae</i> Crawl.....	Chalcid Undet.	India	Mathur, 1935
<i>magnoliae</i> (Ashm.).....	<i>Psyllaephagus solus</i> (Howard)	Florida	Howard, 1885
<i>mallotica</i> (Crawl.).....	Chalcid Undet.	India	Mathur, 1935
<i>maura</i> Först.....	<i>Tetrastichus</i> sp.	California	Present paper
<i>merwei</i> Pettay.....	Undetermined chalcid	South Africa	Merwe, 1923
<i>minuta</i> Crawl.....	<i>Tetrastichus triozae</i> Burks	California	Present paper
<i>minuta arizonae</i> Aulm.....	<i>Aphycus</i> sp.	California	Present paper
<i>urticae</i> (Linn.).....	<i>Tetrastichus obscuratus</i> André	Italy	Grandi, 1953
<i>viridula</i> Zett.....	<i>Tetrastichus</i> sp.	Latvia	Ozols, 1925
<i>vitreoradiata</i> (Mask.).....	Encyrtidae Undet.	New Zealand	Carter, 1949
<i>Trioza</i> sp.....	Chalcid Undet.	India	Mathur, 1935
<i>Trioza</i> sp.....	<i>Tetrastichus gelastus</i> Burks	Florida	Burks, 1943
<i>Trioza</i> sp.....	<i>Tetrastichus dryus</i> Burks	Montana	Burks, 1943
<i>Trioza</i> sp.....	<i>Tetrastichus triozae</i> Burks	Washington	Burks, 1943
Psyllidae (undetermined)			
Psyllid gall (? <i>Trioza</i> sp.).....	<i>Cheiloneurus praenitens</i> Waterston	Jamaica	Waterston, 1922
Psyllid on <i>Cinnamomum</i> sp.....	<i>Psyllaephagus iwayaensis</i> Ishii	Japan	Ishii, 1928
"Bred out of Eucalyptus".....	<i>Psyllaephagus metallicus</i> (Girault)	Australia	Girault, 1915a
Gall-making psyllid.....	<i>Psylledontus secundus</i> Girault	Ceylon	Girault, 1915
Psyllid on <i>Elaeagnus umbellata</i> .....	<i>Psylledontus viridiscutellatus</i> Ishii	Japan	Ishii, 1928
Psyllid.....	<i>Mirocerus psyllae</i> Ashm.	Ceylon	Ashmead, 1904
			Gahan & Peck 1946

## NEW RECORDS OF PARASITES REARED FROM PSYLLID NYMPHS, WITH NOTES ON BIOLOGY

### *Aphalara near angustipennis* Crawford

Parasites: *Psyllaephagus* sp.

Host plant: *Artemisia dracunculus* L.

Locality: Five miles east of Olive, Orange County, California

On July 9, 1942, a collection was made of adults, nymphs, and eggs. Two nymphs were parasitized and from each an adult of *Psyllaephagus* was reared.

### *Aphalara suaedae* Crawford

Parasites: *Psyllaephagus* sp.

Host plant: *Suaeda* sp.

Locality: Three miles northwest of Indio, Riverside County, California

On June 27, 1952, a plant of *Suaeda*, heavily infested with nymphs and adults, was collected by R. F. Smith. Many of the nymphs were parasitized and from them a number of adult *Psyllaephagus* sp. were reared.

### *Aphalaroida pithecolobia* Crawford

Parasites: *Psyllaephagus* sp.

Host plant: *Acacia greggii* Gray.

Locality: Banning, Riverside County, California

On May 11, 1943, nymphs infesting the host plant "catsclaw" were caged on one branch to rear them to the adult stage. On May 26, most of the nymphs had become adults. At this time eight nymphs were obviously parasitized and eight adults of *Psyllaephagus* sp. were reared. Each one emerged through a hole in the dorsum of the caudal portion of the abdomen.

### *Arytaina amorphae* (Mally)

Parasites: *Cheiloneurus* sp. ; *Psyllaephagus* sp.

Host plant: *Amorpha fruticosa* L. (in bloom)

Locality: Eight miles west of Corona, Orange County, California

May 6, 1943, living adults and 8 parasitized nymphs (on the upper surface of the leaves) were collected. No living nymphs were found. On May 8, one adult parasite emerged through a hole in the abdomen of one nymph. On May 19, two more adult parasites emerged. All three were *Cheiloneurus* sp. Host plant: *Amorpha fruticosa* L. (beginning to bloom)

Locality: Cajon Pass, San Bernardino County, California

June 16, 1942, adult psyllids were abundant but only a few living nymphs were found. One nymph was parasitized. The adult parasite, *Psyllaephagus* sp., emerged and had died by June 25.

### *Arytaina aculeata* Crawford

Parasites: *Psyllaephagus* sp.

Host plant: *Cercocarpus betuloides* Nutt.

Locality: San Timoteo Canyon, Riverside County, California

April 7, 1943, nymphs were found feeding in the axils of the leaves and on tender shoots and also at the base of the flower stems. A cloth sleeve cage was placed on the branch to prevent dispersal of the adults as they emerged. On May 15, practically all psyllids in the cage had reached the adult stage.



A single parasitized nymph was placed in a glass vial. The adult parasite had emerged and was still alive May 19.

***Arytaina bicolor* Jensen**

Parasites: *Prionomitus* sp.; *Tetrastichus* sp.

Host plant: *Ceanothus cuneatus* (Hook.) Nutt.

Locality: Mt. Diablo, Contra Costa County, California

May 25, 1949, adults were emerging in large numbers. Nymphs were common and occurred on the leaves which rolled upward and inward as a result of the nymphal feeding. The nymphs were concealed in the rolled leaves. The feeding of the nymphs also caused the infested leaves to become chlorotic and smaller than normal. The toxic effect of nymphal feeding was local and did not influence the growth of noninfested leaves of the same fascicle.

Several nymphs were found to be parasitized even though they were in the rolled leaves. Eight males and one female *Prionomitus* sp. emerged from the parasitized nymphs. One of these emerged June 3 and the others by June 5. A single psyllid nymph was observed in the field to have a parasite larva attached to the outside venter of the body. The nymph and larva were placed in a glass vial for observation and rearing, May 25. On May 31 the parasite larva began to pupate between the nymph and the wall of the vial. June 4 the parasite had not yet emerged and the pupa was black. The adult parasite emerged June 5 or June 6 and proved to be *Tetrastichus* sp.

***Arytaina ceanothi* Crawford**

Parasites: *Prionomitus mitratus* (Dalm.); *Tetrastichus triozae* Burks;

*Psyllaephagus* sp.; *Pachyneuron* sp.

Host plant: *Ceanothus crassifolius* Torr.

Locality: Oak Glen, Riverside County, California

On March 30, 1943, nymphs and adults were found to be extremely abundant on the host plant. The nymphs were feeding primarily at the base of the flowers. Several nymphs were parasitized and were caged in glass vials. Ten parasite adults emerged between April 12 and April 14. Of the seven which have been identified, one was *Prionomitus mitratus*, one was *Pachyneuron* sp., and five were *Psyllaephagus* sp.

Host plant: *Ceanothus tomentosus* Parry (in bloom)

Locality: Wildwood Canyon, Yucaipa, San Bernardino County, California

Living adults and nymphs and two parasitized nymphs were collected April 11, 1943. On April 24, two adult parasites had emerged and were still alive. These were *Tetrastichus triozae* and *Psyllaephagus* sp.

Host plant: *Ceanothus integerrimus* H. & A.

Locality: Sequoia National Park, California (Elev. 4,500 ft.)

Living nymphs were collected May 18, 1949. One nymph was parasitized, but was still active enough to walk a little on May 21. The parasite adult, *Prionomitus* sp., emerged June 4 through a circular hole in the dorsum of the abdomen.

Host plant: *Ceanothus cuneatus* (Hook.) Nutt.

Locality: Mt. Diablo, Contra Costa County, California

May 25, 1949, adults were common but no living nymphs were found. A single parasitized nymph was caged and the adult parasite, *Psyllaephagus* sp., emerged the same day.

***Arytaina essigi* Jensen**Parasites: *Prionomitus mitratus* (Dalm.)Host plant: *Ceanothus tomentosus* Parry

Locality: San Timoteo Canyon, Riverside County, California

On February 26, 1943, several nymphs and adults of this species were collected. The nymphs occurred at or just below the ground level feeding on the main woody branches of the bush. In addition, a few were found just above ground in a sheltered area under some loose bark. Several nymphs were caged singly in vials and provided with food. One nymph had remained active in the vial for two weeks and then became inactive. On April 21, 1943, one adult parasite of *Prionomitus mitratus* emerged through a hole in the dorsum of the abdomen. Three days later a second parasite emerged from the same nymph.

***Arytaina fuscipennis* Crawford**Parasites: *Prionomitus mitratus* (Dalm.)Host plant: *Ceanothus velutinus* Dougl.

Locality: Mountains east of Bountiful, Davis County, Utah (Elev. 8,000 ft.)

July 1, 1943, adult psyllids were common on the foliage of the host plant and nymphs occurred on the main branches just below the surface of the soil or at places where the branches rested against the soil. Most of the nymphs were in their last instar and many of them were parasitized. These were caged in vials to await parasite emergence. By July 22, 1943, thirty adult *Prionomitus mitratus* had emerged and were dead.

***Arytaina insolita* Tuthill**Parasites: *Prionomitus mitratus* (Dalm.)Host plant: *Ceanothus velutinus* Dougl.

Locality: Mountains east of Bountiful, Davis County, Utah (Elev. 8,000 ft.)

Living adults and nymphs were collected July 1, 1943. A single parasitized nymph was held in a glass vial. The adult parasite emerged and had died by July 22.

***Arytaina minuta* Crawford**Parasites: *Prionomitus mitratus* (Dalm.); *Tetrastichus triozae* BurksHost plant: *Ceanothus crassifolius* Torr.

Locality: North ridge of Moreno Valley, Riverside County, California

April 7, 1943, several nymphs were collected and caged in vials for rearing to the adult stage. On April 11, several of the caged nymphs were beginning to develop the swollen appearance characteristic of parasitized nymphs. On April 25, four adult parasites emerged through the dorsum of the abdomen of four nymphs. On April 30, two more parasites emerged. All proved to be *Prionomitus mitratus*.

Host plant: *Ceanothus crassifolius* Torr.

Locality: Beaumont, Riverside County, California

April 13, 1943, parasitized nymphs were placed in rearing vials. Between May 1 and May 3, eight *Prionomitus mitratus* adults emerged from the parasitized nymphs through holes in the dorsum of the abdomen and one *Tetrastichus triozae* emerged through a smaller hole beneath the head.

***Arytaina "robusta"* Crawford**Parasites: *Prionomitus mitratus* (Dalm.); *Prionomitus* sp.; *Psyllaephagus* sp.

Host plant: *Ceanothus tomentosus* Parry

Locality: Yucaipa, San Bernardino County, California

Adults were abundant and a few living nymphs occurred on the leaves May 14, 1943. Several nymphs were placed in rearing vials. On May 16, one nymph, which had been active on May 14, had become immobile, was somewhat swollen and had turned a light brown color. The movement of a parasite larva could be discerned inside the nymphal body. The date of the adult parasite's emergence was not determined. It was identified as *Prionomitus mitratus*.

Host plant: *Ceanothus leucodermis* Green

Locality: Sequoia National Park, Tulare County, California (Elev. 6,400 ft.)

Adults and nymphs were collected May 18, 1949, from the new growth of a single bush growing against some large boulders with a south exposure. The other bushes in the vicinity had made no new growth as yet because of the near freezing temperatures at night and the prevalence of snow over the area. One nymph was parasitized and the adult parasite emerged June 3 through a circular hole 0.5 mm. in diameter in the dorsum of the abdomen. The parasite was *Psyllaephagus* sp.

Host plant: *Ceanothus velutinus* Dougl.

Locality: Five miles south of Sierraville, Sierra County, California

Adults and nymphs were collected June 26, 1949, and several nymphs were reared to the adult stage. The nymphs occurred primarily in the angle formed by two leaves which were in contact with each other—in most cases due to the activities of a leaftying caterpillar.

On July 5, four nymphs were observed to be swollen as if parasitized. They had been normal in appearance when collected June 26. Only two adult parasites were recovered. On July 15 one had emerged and was dead. A second parasite became an adult inside the psyllid nymph, but died without emerging. Both were males of *Prionomitus* sp.

Host plant: *Ceanothus cordulatus* Kell.

Locality: Buck's Lake, Plumas County, California (Elev. 5,500 ft.)

Adults and nymphs were collected June 27, 1949. A single parasitized nymph was placed in a rearing vial. Emergence of the adult parasite from the psyllid nymph was observed July 12, 1949. A round hole was chewed in the venter of the abdomen of the psyllid. Several attempts were made by the parasite to emerge before the hole was made large enough to allow passage of the head and antennae. The material bitten off in making the emergence hole was swallowed by the parasite, *Prionomitus* sp.

*Calophya californica* Schwarz

Parasites: *Tetrastichus triozae* Burks

Host plant: *Rhus ovata* Wats.

Locality: San Timoteo Canyon, Riverside County, California

On March 26, 1942, branches of sumac, with the flower buds still unopened, were taken into the laboratory at San Bernardino. The nymphs were found feeding only on the floral buds, and always had their heads directed toward the bud attachment to the peduncle.

Several of the nymphs were parasitized when collected March 26. Two adults of *Tetrastichus triozae* emerged April 2, while a third had broken a



hole in the middle of the psyllid nymph's dorsum and could be seen moving its legs. This parasite emerged between 8:00 a.m. and 9:00 a.m. on April 3, and, although its wings were not yet dry at 9:00 a.m. it was copulating with one of the adults which had emerged the day before.

***Calophya nigrella* Jensen**

Parasites: *Tetrastichus triozae* Burks

Host plant: *Rhus trilobata* Nutt.

Locality: San Timoteo Canyon, Riverside County, California

On February 26, 1943, most of the *Rhus trilobata* bushes were still dormant but a few were beginning to blossom and produce very young leaves. Several adults and nymphs were collected, the nymphs being scattered sparsely over the woody branches. None occurred on the flowers or leaves.

Among the nymphs caged on twigs were several which appeared to be parasitized. Only one parasite adult was obtained and it did not emerge until March 21, 1943. It was *Tetrastichus triozae*.

***Calophya triozmima* Schwarz**

Parasites: *Tetrastichus triozae* Burks

Host plant: *Rhus trilobata* Nutt.

Locality: Mill Creek Canyon, San Bernardino County, California

On April 16, 1943, nymphs and adults occurred on the young leaves and to a lesser extent on the blossoms. Eight parasitized nymphs were caged and the emerging parasites were all *Tetrastichus triozae*. They emerged between April 16 and April 28. Two of the parasites did not emerge through holes cut for that purpose in the dorsal surface of the nymph, but had eaten away the ventral surface of the nymph's body and merely pushed the shell up enough to crawl out.

***Euphalerus vermiculosus* Crawford**

Parasites: Undet.

Host plant: *Ceanothus cordulatus* Kell.

Locality: Lake Almanor, Plumas County, California

Adults and nymphs were collected July 13, 1949. On July 25, two of the nymphs held in a rearing cage were observed to be swollen as if parasitized. The adult parasites emerged, but have not yet been determined.

***Euphalerus vermiculosus beameri* Tuthill**

Parasites: *Tetrastichus triozae* Burks

Host plant: *Ceanothus leucodermis* Green

Locality: Big Pines Camp, Los Angeles County, California

Branches, infested with nymphs, were cut June 21, 1942, and taken to San Bernardino for rearing and observation. The nymphs feed on the under side of the leaves where they form a cottony, waxy cell which completely surrounds them and, when fully formed, is approximately 3.5 mm. in outside diameter. This flocculent mass is produced by the nymph as wax threads, coming from the circum-anal area and the basal portion of the caudal segments. Freshly produced wax threads are loosely curled among themselves, shiny grayish white in color and easily discernible as individual threads. The flocculence of old and abandoned cells is more compact, whiter, and the component threads are not so apparent.

As the cottony mass becomes larger, both above and below the nymphs, the cell, formed by the body movements, is gradually forced away from the surface of the leaf—particularly the caudal portion. The nymph is finally situated at about a 30-degree angle to the leaf surface. The wax mass does not adhere to the leaf except over a small area around the feeding site. The early nymphal exuviae are gradually carried away with the newly formed wax threads and appear in the surface portion of the mass.

It is not known whether nymphs become parasitized while still in the wax cell or whether this occurs after they leave the cell or just before they become adults. Two adults of *Tetrastichus triozae* emerged July 1, 1942, from nymphs held in glass vials.

***Euphyllura arbuti* Schwarz**

Parasites: *Psyllaephagus arbuticola* Gahan and Waterston; *Psyllaephagus* sp.

Host plant: *Arbutus menziesii* Pursh.

Locality: El Cerrito, Contra Costa County, California

A branch of the host tree, infested with nymphs, was brought to the writer by Mrs. P. L. Small in May, 1949. One nymph was parasitized by *Psyllaephagus* sp. Gahan and Waterston (1926) described as new the species *Psyllaephagus arbuticola* from specimens reared from a psyllid on *Arbutus* in San Mateo and Alameda Counties, California, and specimens reared from *Euphyllura arbuti* at Stanford University, California. It is probable that the specimen reported in the present work will prove to be *Psyllaephagus arbuticola*.

***Euphyllura arctostaphyli* Schwarz**

Host plant: *Arctostaphylos* sp.

Locality: Lake Almanor, Plumas County, California

On July 13, 1949, nymphs occurred under the conspicuous, white, waxy masses which they produce. These occurred almost exclusively where two leaves were held against each other—usually due to the activities of leaf tiers. Nymphs were also feeding on the woody main stems, but only at places where the bark was cracked and the nymphs could get beneath part of the bark. On July 25 three parasitized nymphs were noted in the rearing tubes. The emerging adult parasites are as yet undetermined.

***Pachypsylla venusta* O. S. and *P. celtidis-vesicula* Crawford**

Parasites: *Torymus* (*Callimome*) sp. near *scalaris* Huber; *Psyllaephagus* sp. near *pachypsyllae* (Howard); *Eurytoma* sp.

Host plant: *Celtis douglasi* Planchon

Locality: Lucile, Idaho County, Idaho

On October 16, 1941, adults of *Pachypsylla venusta* were common on the host plant which also carried many of the galls produced on the leaf petioles and the base of the leaves. On the same plant were many leaf galls infested with nymphs of *Pachypsylla celtidis-vesicula*. The adults of this species had not begun to emerge.

Foliage, bearing galls of both species, was taken to San Bernardino, California, where the galls were kept dry and at room temperature. Adults of both species were reared, *venusta* emerging as late as February, 1942, and *celtidis-vesicula* as late as the end of December, 1941.

Examination of the nymph-infested galls of both *venusta* and *celtidis-vesicula* revealed that several galls each contained one hymenopterous larva which apparently developed outside of the psyllid nymph but fed on the nymph. Nothing was left of the psyllid nymph in most galls except the more heavily sclerotized portions of the exoskeleton. The skin of one nymph was entire, but was collapsed as if the body contents had been sucked out.

Six adult parasites emerged between February and April 20, 1942, and an additional eight parasites emerged after April 20. Both psyllid species had been parasitized, but the material became mixed and it could not be determined from which host species the respective parasites had emerged.

***Paratrioza maculipennis* (Crawford)**

Parasites: *Tetrastichus* sp.

Host plant: *Convolvulus* sp.

Locality: Palo Alto, Santa Clara County, California

Nymphs and adults were collected by E. S. Sylvester and D. D. Jensen on October 15, 1948. The nymphs were very abundant on the upper portions of the roots, 1 to 2 inches below the surface of the soil, on the main stem of the plant and 1 to 2 inches up the foliage branches above the ground. The exit holes of parasites were noted in a number of nymphs and 15 adults of *Tetrastichus* sp. were reared from nymphs taken into the laboratory at Berkeley. Emergence of the parasites occurred between October 15 and October 26, 1948.

***Pexopsylla cercocarpi* Jensen**

Parasites: *Tetrastichus triozae* Burks, *Tetrastichus* sp., *Prionomitus mitratus* (Dalm.), *Psyllaephagus* sp.

Host plant: *Cercocarpus betuloides* Nutt.

Locality: San Timoteo Canyon, Riverside County, California

Adults and nymphs, including two parasitized nymphs, were collected February 2, 1943. The adult parasite emerged from one nymph February 6 and from the second nymph February 10. They were identified as *Tetrastichus* sp. Both emerged through circular holes in the dorsum at the juncture of head and thorax.

Host plant: *Cercocarpus ledifolius* Nutt.

Locality: Wrightwood, San Bernardino County, California

Adults and nymphs were collected on April 28, 1943. On May 2, three nymphs were suspected of being parasitized. Two of them were obviously swollen and the exoskeletons were stiff. The third nymph was still of normal light green color, and, though slightly swollen, the exoskeleton was pliant. Parasites emerged from all three nymphs by May 17, and were identified as *Tetrastichus triozae*, *Prionomitus mitratus*, and *Psyllaephagus* sp.

***Psylla americana* Crawford**

Parasites: *Prionomitus mitratus* (Dalm.); *Prionomitus* sp.

Host plant: *Salix* sp.

Locality: Mill Creek Canyon, San Bernardino County, California

Adults and nymphs were collected in large numbers April 1, 1943. Two parasitized nymphs were caged. The adult parasites emerged from one nymph April 8 and from the second nymph April 10. They were identified as *Prionomitus* sp. (Jensen, 1951).



Host plant: *Salix* sp.

Locality: Bar Bear, San Bernardino County, California (Elev. 6,000 ft.)

On June 7, 1942, adults and nymphs were abundant on the host plant. Leaves, infested with nymphs, were taken to the laboratory for rearing. Three weeks later several nymphs were observed to have been parasitized, but the parasites except one had emerged and escaped. In this case, the adult parasite had died while still in the body of the psyllid nymph. The parasite had succeeded in cutting an adequately large emergence hole in the dorsal surface of the abdomen, but died without emerging. It was identified as *Prionomitus mitratus*.

Host plant: *Salix* sp.

Locality: Hobart Mills, Nevada County, California

Adults and nymphs were present in small numbers June 26, 1949. An adult of *Prionomitus* sp. emerged from one nymph.

***Psylla breviata* Patch**

Parasites: *Prionomitus* sp.

Host plant: *Salix* sp.

Locality: Hobart Mills, Nevada County, California

Several adults and nymphs, including some parasitized nymphs, were collected June 26, 1949 (Jensen, 1951). One adult of *Prionomitus* sp. emerged from one psyllid nymph, and the parasite in a second nymph became an adult but died within the psyllid nymph.

***Psylla brevistigmata* Patch**

Parasites: Undetermined Pteromalidae

Host plant: *Cercocarpus betuloides* Nutt.

Locality: Kaweah, Tulare County, California

Adults and nymphs were collected May 21, 1952, the nymphs occurring in the protected places provided by the severely rolled leaves. The malformation apparently resulted from the feeding of the nymphs.

On May 27, an adult parasite (undetermined Pteromalidae) emerged through a hole cut in the dorsal surface of a nymph's body.

***Psylla floccosa* Patch**

Parasites: *Prionomitus* sp.; Undetermined Pteromalidae

Host plant: *Alnus* sp.

Locality: Buck's Lake, Plumas County, California

On July 14, 1949, nymphs were numerous on the terminal shoots and on the young sucker growth of the host plant. A few of the nymphs were parasitized and these were placed in rearing vials. On July 25 five parasites had emerged, two being alive, and the other three dead. One female and two males were *Prionomitus* sp.; one male and one female are listed as undetermined Pteromalidae.

***Psylla near media* Tuthill**

Parasites: *Prionomitus mitratus* (Dalm.)

Host plant: *Cercocarpus betuloides* Nutt.

Locality: Forest Home, San Bernardino County, California

March 6, 1943, twenty last-instar nymphs were collected and placed in glass vials with leaves of the host plant. Twelve adult psyllids were reared from these nymphs. Three nymphs proved to be parasitized and adult

parasites were reared from two of these. One parasite emerged through a hole cut in the dorsum of the nymph's abdomen March 24 and the second parasite emerged March 27. Both were *Prionomitus mitratus*.

***Psylla minuta* Crawford**

Parasites: *Psyllaephagus* sp.

Host plant: *Purshia tridentata* DC.

Locality: Wrightwood, San Bernardino County, California

Adults and nymphs occurred on the host plant in large numbers April 28, 1943, in the presence of small numbers of *Psylla coryli*. Several nymphs were parasitized and are presumed to be nymphs of *minuta*. By May 17, five adult parasites of *Psyllaephagus* sp. had emerged from their host nymphs and were dead. Each had emerged through a hole cut in the dorsum of the nymph's abdomen.

***Psylla ribesiae* (Crawford)**

Parasites: *Prionomitus mitratus* (Dalm.)

Host plant: *Ribes* sp. (Wild currant)

Locality: Espanola, Rio Arriba County, New Mexico

Among the nymphs and adults collected on June 3, 1943, were two parasitized nymphs which were placed in rearing vials. On June 20, 1943, one parasite had emerged and was lost. The parasite in the second nymph had become an adult and was moving within the shell of the psyllid nymph. However, this parasite died without emerging. It was removed and identified as *Prionomitus mitratus* (Jensen, 1956).

***Psylla tenuata* Jensen**

Parasites: *Prionomitus* sp.

Host plant: *Salix laevigata* Bebb.

Locality: Colton, San Bernardino County, California

On March 13, 1943, nymphs were feeding on the staminate catkins with their heads directed toward the catkin stem. What appeared to be a parasitic wasp was observed to drag a psyllid nymph on its back by grasping the back of the nymph with its hind legs. It was not determined whether or not the parasite oviposited in the nymph, but the nymph appeared to be paralyzed for several minutes and then began to crawl. The psyllid and the parasite were caged for subsequent observation, but were lost before additional information was obtained.

On April 7, 1943, eight parasitized nymphs were collected from the same host tree examined March 13. Between April 18 and April 24 seven adult parasites emerged. The emergence hole was cut in the dorsum of the abdomen in six of the nymphs and in the venter of the seventh. They were identified as an undescribed species of *Prionomitus* (Jensen, 1951).

***Trioza albifrons* Crawford**

Parasites: *Tetrastichus triozae* Burks

Host plant: *Urtica* sp.

Locality: Live Oak Canyon, San Bernardino County, California

Adults, nymphs, and eggs were common on the terminal growth of the host plant February 2, 1943. One nymph was parasitized and attached to the under side of the leaf by a network of fine, dry threads. The entire venter

of the nymph had been eaten away so that the parasite was in direct contact with the leaf. The parasite adult, *Tetrastichus triozae*, emerged February 10 by pushing the nymphal shell away from the leaf a little instead of through a hole in the dorsum as is usually done.

***Trioza bakeri* Crawford**

Parasites: *Tetrastichus* sp.; *Psyllaephagus* sp.

Host plant: *Rhamnus crocea* var. *ilicifolia* Green

Locality: Kaweah, Tulare County, California

Living adults and nymphs were collected May 21, 1952. The feeding of the nymphs apparently caused the leaves to roll, thus providing a somewhat protected place for the nymphs. Several parasitized nymphs were placed in glass vials, and by May 27 eight specimens of *Tetrastichus* sp. and three specimens of *Psyllaephagus* sp. had emerged from the nymphs.

***Trioza beameri* Tuthill**

Parasites: *Prionomitus mitratus* (Dalm.); *Tetrastichus triozae* Burks;  
*Psyllaephagus pachypsyllae* (Howard)

Host plant: *Rhamnus californica* Esch.

Locality: Mill Creek Canyon, San Bernardino County, California

A few last-instar nymphs occurred on the under side of the leaves April 16, 1943. Two nymphs were parasitized and an adult *Prionomitus mitratus* emerged from one of them.

Host plant: *Rhamnus californica* Esch.

Locality: Wrightwood, San Bernardino County, California (Elev. 6,000 ft.)

On June 21, 1942, adults, nymphs, and eggs occurred on the host plant. Several nymphs were parasitized and between June 25 and June 28, an adult *Tetrastichus triozae* and one adult *Psyllaephagus pachypsyllae* emerged.

***Trioza maura* Foerster**

Parasites: *Tetrastichus* sp.

Host plant: *Salix* sp.

Locality: Sequoia National Park, Tulare County, California (Elev. 6,500 ft.)

On September 14, 1948, nymphs were present in large numbers and usually occurred on the under surface of the leaves. The nymphs apparently had a toxic effect upon the plant, because a yellow blotch developed in the leaf around the feeding site of each nymph.

Some parasitized nymphs were collected in glass vials and held for emergence of the adult wasps. By September 22 two adult parasites had emerged and a third was observed during its emergence. It was lying on its back and had cut a round hole in the dorsum of the nymph's thorax. Actual emergence from the nymph, after the hole was made, occupied only one minute. Five parasites were reared and all proved to be *Tetrastichus* sp.

***Trioza minuta arizonae* Aulmann**

Parasites: *Aphycus* sp.

Host plant: *Salix lasiandra* Benth.

Locality: Five miles east of Olive, Orange County, California

Adults and nymphs were collected from the leaves July 9, 1942. Adult psyllids were not reared from any of the nymphs, so the evidence is only presumptive that the nymphs were *T. minuta arizonae*.

Three adults of *Aphycus* sp. were reared from a single parasitized nymph.



*Trioza minuta* Crawford?Parasites: *Tetrastichus triozae* BurksHost plant: *Salix* sp.

Locality: Colton, San Bernardino County, California

On April 16, 1943, three triozone nymphs were collected on a single leaf of the host plant. The leaf was placed in a vial to rear the adult psyllids. A female adult of *Trioza minuta* developed from one nymph, but the other two nymphs proved to be parasitized by *Tetrastichus triozae*. Emergence of the adult parasites occurred through the dorsum of the thorax in each case.

## ACKNOWLEDGMENTS

Most of the parasites reared during this investigation were identified by A. B. Gahan and B. D. Burks of the Division of Insect Detection and Identification, U. S. National Museum. The balance were identified by F. E. Skinner, University of California, Berkeley. Grateful acknowledgment is made for this service and for the corrections made by Mr. Skinner in the manuscript.

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